It is well known, that the flow rate (Q) of a Newtonian fluid in a tube or channel is linked to the pressure difference (Dp) between the two ends of the tube by the relation:

$$Dp=R*Q,$$

where R is the fluid resistance of the tube or channel. In micro-channels the small dimensions usually imply that the Reynolds number is low, and hence that the flow is laminar. Furthermore, micro-channels usually present transverse dimensions, which are much smaller than their longitudinal dimension, and hence the flow is fully developed. In these conditions, the dimension of the channel generally characterizes the fluid resistance. For example, in a channel with a circular cross-section, the resistance takes the following form:

$$R=(8*m*L)/(\pi*r^4),$$

where m is the dynamic viscosity of the fluid, L is the length of the channel and r its radius. As the resistance depends on the 4^{th} power of the channel diameter, a slight change in diameter can lead to large changes in the channel resistance. For example, 10% difference between the resistance of two circular microchannels with a nominal diameter of 50 microns can be caused by a difference in average diameter of 1.2 micron only. Such small differences may be caused by the inherent uncertainties of many micro-manufacturing techniques. Such small differences may also be caused by the deposition of impurities inside the channel, either before or during their use.